

## WHAT IS CLAIMED IS:

1           1. A waveguide device which acts as a waveguide in at least one  
2 direction thereof, the device comprising:

3                 a core having a pump input surface for receiving pumping radiation  
4 at a pumping wavelength and at least one output surface for emitting a laser beam  
5 at an output wavelength; and

6                 means for providing pump-light confinement and means for providing  
7 output mode control in different sections of the device along the direction of beam  
8 propagation.

1           2. The device as claimed in claim 1 wherein the core is a single  
2 member.

1           3. The device as claimed in claim 1 wherein the core includes  
2 an active core member and a passive core member.

1           4. The device as claimed in claim 1 wherein the means for  
2 providing pump-light confinement includes a pump-light containment component in  
3 contact with a surface of the core in a pumping section of the device.

1           5. The device as claimed in claim 4 wherein the pump-light  
2 containment component is a pump cladding.

1           6. The device as claimed in claim 1 wherein the means for  
2 providing output mode control includes a coating in contact with the core.

1           7. The device as claimed in claim 5 wherein the means for  
2 providing output mode control includes a mode control cladding in contact with the  
3 core.

1           8. The device as claimed in claim 1 wherein the means for  
2 providing output mode control includes a grating in contact with the core.

1                   9.     The device as claimed in claim 1 wherein the core is a planar  
2     core.

1                   10.    The device as claimed in claim 1 wherein the core is a  
2     cylindrical core.

1                   11.    The device as claimed in claim 1 further comprising a  
2     substrate for supporting the core.

1                   12.    The device as claimed in claim 1 wherein the device is a laser.

1                   13.    The device as claimed in claim 12 wherein the laser is a  
2     planar waveguide laser.

1                   14.    The device as claimed in claim 1 wherein the core has laser  
2     input surface for receiving a source laser beam to be amplified and wherein the  
3     device is a optical amplifier.

1                   15.    The device as claimed in claim 14 wherein the core is planar  
2     and wherein the optical amplifier is a planar waveguide amplifier.

1                   16.    The device as claimed in claim 14 wherein the laser input  
2     surface is different from either the pumping input surface or the at least one output  
3     surface.

1                   17.    The device as claimed in claim 14 wherein the laser input  
2     surface is the same as the at least one output surface.

1                   18.    The device as claimed in claim 1 wherein an output mode  
2     control section of the device has a lower NA than a pumping section of the device.

1               19. The device as claimed in claim 18 wherein the pumping  
2 section has a NA greater than 0.05.

1               20. The device as claimed in claim 18 wherein the output mode  
2 control section has a NA less than 0.22.

1               21. The device as claimed in claim 9 wherein the planar core  
2 includes doped YAG.

1               22. The device as claimed in claim 5 wherein the pump cladding  
2 has a lower refractive index than the refractive index of the core.

1               23. The device as claimed in claim 22 wherein the pump cladding  
2 is sapphire or undoped YAG.

1               24. The device as claimed in claim 7 wherein the mode control  
2 cladding includes a material having a refractive index between that of the core and  
3 that of the pump cladding.

1               25. The device as claimed in claim 24 wherein the mode control  
2 cladding includes doped or undoped YAG.

1               26. The device as claimed in claim 9 wherein the planar core  
2 includes a first core member which absorbs the pumping radiation and a separate  
3 second core member which either does not absorb the pumping radiation or has an  
4 absorption lower than the absorption of the first core member at the pumping  
5 wavelength.

1               27. The device as claimed in claim 9 wherein the device acts as  
2 a pair of separate waveguides which are butt-coupled or coupled together by an  
3 imaging system.

1                   28.     The device as claimed in claim 18 wherein the device is an  
2     optical fiber.

1                   29.     The device as claimed in claim 28 wherein the means for  
2     providing output mode control includes a mode control cladding different from the  
3     pump cladding.

1                   30.     The device as claimed in claim 29 wherein the device  
2     comprises sections of different types of fiber which are either spliced, butt-coupled  
3     or coupled together by imaging an output from one section into the other section.

1                   31.     A method for generating a laser beam having a desired output  
2     mode, the method comprising:

3                         providing a core having a pump input surface and at least one output  
4     surface, the core serving as a waveguide in at least one direction;

5                         pumping the core at the pump input surface with pumping radiation  
6     at a pumping wavelength so that an output laser beam is emitted at the at least one  
7     output surface at an output wavelength; and

8                         separating the functions of pump-light confinement and output mode  
9     control to different sections along the length of the waveguide.

1                   32.     The method as claimed in claim 31 wherein the core has a  
2     laser input surface and wherein the method further comprises transmitting a source  
3     laser beam into the core at the laser input surface wherein the source laser beam is  
4     amplified within the core and wherein the output beam is an amplified source laser  
5     beam.